Test Review:

- Variables: Units:

Δx	m
Δy	m
$\bar{v}_i, \bar{v}_{ix}, \bar{v}_{iy}$	m/s
$\bar{v}_f, \bar{v}_{fx}, \bar{v}_{fy}$	m/s
a_g (= 9.8 down)	m/s^2
$a_x = \emptyset$	m/s^2
t	s
θ_i, θ_f	degrees

- Equations:

$$\Delta x = v_{ix} t$$

$$\Delta y = v_{iy} t + \frac{1}{2} a_g t^2$$

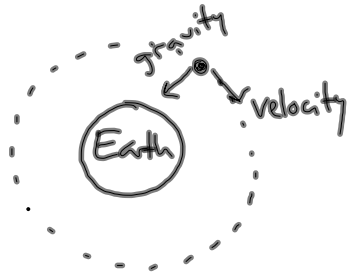
$$v_{fy} = v_{iy} + a_g t$$

$$v_{fy}^2 = v_{iy}^2 + 2 a_g \Delta y$$

- Assume $v_{iy} = 0$ m/s when projectile is launched horizontally.

- Launched object is called a <u>projectile</u>.

- What is "floating in space?"



  - "Floating in space" is an object continually falling around the Earth.

- For maximum Δx, the best launch angle is 45°.

- Relationship between initial launch angle and initial velocity of x- and y-components

$\theta_i > 45°$, $v_{iy} > v_{ix}$

$\theta_i = 45°$, $v_{iy} = v_{ix}$

$\theta_i < 45°$, $v_{iy} < v_{ix}$

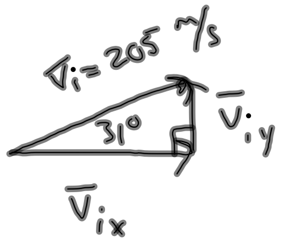
Cannon launches a ball at 31° with a velocity of 205 m/s. If the ball travels 1020 m in the x-direction, find

a) time it is in the air.

b) maximum height.

a) $$\Delta x = v_{ix} t$$

$$t = \frac{\Delta x}{v_{ix}} = \frac{1020\text{ m}}{175.7\text{ m/s}} = 5.8\text{ s}$$



$v_{ix} = v_i \cos(31°) = 175.7$ m/s

$v_{iy} = v_i \sin(31°) = 105.6$ m/s

b) $$\Delta y = v_{iy} t + \frac{1}{2} a_g t^2$$ * new ti… is 2.9 s

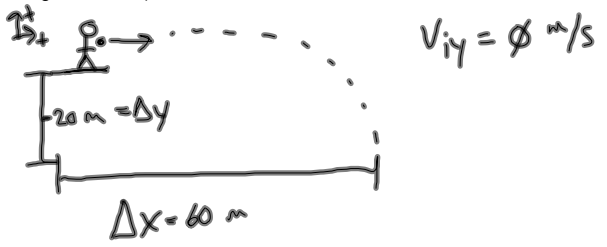
$$= (105.6\text{ m/s})(2.9\text{ s}) + \frac{1}{2}(-9.8\text{ m/s}^2)(2.9…$$

$a_g = -9.8$ m/s²

$$= 265\text{ m}$$

Test Review and Practice Problems 2.27.12 Honors Physics

A boy standing on a balcony 20 m off the ground throws a ball 60 m in the x-direction.
a) With what initial velocity (horizontally) did the boy throw the ball?
b) With what final velocity did the ball have just before it struck the ground (magnitude, angle, direction)?



a) find time first

$$\Delta y = \cancel{V_{iy}}^{\,0}\, t + \tfrac{1}{2} a_g t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_g}}$$

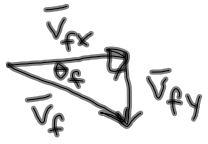
$$= \sqrt{\frac{2(-20\text{ m})}{(-9.8\text{ m/s}^2)}}$$

$$= 2.02\text{ s}$$

$$\Delta x = v_{ix} t$$

$$v_{ix} = \frac{\Delta x}{t} = \frac{60\text{ m}}{2.02\text{ s}} = 29.7\text{ m/s}$$

b) find $\bar{v}_f$



- direction is S of E
- Pythagorean thm. to find $v_f = 35.6$ m/s
- inverse tan

$\theta_f = 33.7°$

$$v_{fx} = v_{ix} = 29.7\text{ m/s}$$

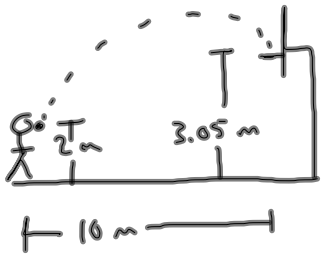
$$v_{fy} = \cancel{v_{iy}}^{\,0} + a_g t$$

$$= (-9.8\text{ m/s}^2)(2.02\text{ s})$$

$$= -19.8\text{ m/s}$$

Test Review and Practice Problems 2.27.12 Honors Physics

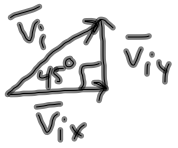
A 2.00 m tall basketball player attempts a goal 10.00 m from the basket (3.05 m high). If he shoots the ball at a 45 degree angle, at what initial speed must he throw the basketball so that it goes through the hoop without striking the backboard?



$\Delta y = 3.05\,m - 2\,m$

$= 1.05\,m$

$\Delta x = 10\,m$



Because a 45° triangle,

$v_{ix} = v_{iy}$

$\Delta x = v_{ix} t$ $\quad \Delta y = v_{iy} t + \frac{1}{2} a_g t^2$

$t = \frac{\Delta x}{v_{ix}}$ $\quad \Delta y = v_{iy}\left(\frac{\Delta x}{v_{iy}}\right) + \frac{1}{2} a_g \left(\frac{\Delta x}{v_{iy}}\right)^2$

$= \frac{\Delta x}{v_{iy}}$ $\quad \Delta y = \Delta x + \frac{a_g (\Delta x)^2}{2 v_{iy}^2}$

$\Delta y - \Delta x = \frac{a_g (\Delta x)^2}{2 v_{iy}^2}$

use $-9.8\ m/s^2$ for a_g

$v_{iy}^2 = \frac{a_g (\Delta x)^2}{2(\Delta y - \Delta x)}$

$v_{iy} = \sqrt{\frac{a_g (\Delta x)^2}{2(\Delta y - \Delta x)}}$

$= \sqrt{\frac{(-9.8\ m/s^2)(10\ m)^2}{2(1.05\ m - 10\ m)}}$

$= 7.39\ m/s$

Pythag. thm.

$v_i = 10.5\ m/s$